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DCXLVIII.—CAMPHOR.

(*Cinnamomum Camphora*, Nees.)

Enquiries continue to be made as to the cultivation of the tree producing this substance. A brief note was given in the *Kew Bulletin* for 1895 (p. 305).

Hitherto the use of camphor in medicine and the arts has been comparatively small. A new application is, however, likely to increase its consumption, perhaps indefinitely. This is described in the following words by Sir Frederick Abel, in a letter printed in the *Bulletin* :—

"This substance has been used extensively for many years past, and no doubt in continually increasing quantities, for the conversion of collodion cotton into the material known as *Celluloid*, which is applied to the manufacture of imitation ivory, tortoise-shell, horn, and a great variety of purposes."

An excellent account of the natural history and economic applications of the camphor tree was issued in 1897 by the Division of Botany of the United States Department of Agriculture, *Circular* No. 12. It is reproduced with some slight condensation :—

"DESCRIPTION.

"The camphor tree is an evergreen, related to the bay and to the sassafras of the United States. In its native habitat it attains a height of 60 to 100 feet, with wide-spreading branches and a trunk 20 to 40 inches in diameter. The leaves are broadly lanceolate in form, acuminate at both base and apex, of a light green colour, smooth and shining above and whitish or glaucous on the under surface. The lower pair of lateral veins are more prominent than the others, but the leaves are not as distinctly 3-nerved as

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those of the cinnamon and many other species of the genus. The small white or greenish-white flowers are borne in axillary racemes from February to April on shoots of the previous season, and are followed in October by berry-like, one-seeded fruits about three-eighths of an inch in diameter. The fruiting pedicels terminate in a saucer-shaped disk, persisting after the mature fruit has fallen.

"NATIVE RANGE.

"The camphor tree is native in the coast countries of Eastern Asia from Cochin China nearly to the mouth of the Yang-tse-kiang, and on the adjacent islands from the southern part of the Japanese Empire, including Formosa and the Loochoo Islands, to Hainan, off the coast of Cochin China. Its range also extends into the interior of China as far as the province of Hupeh, about 500 miles from the coast on the Yang-tse-kiang, in latitude 30° north. This area, extending from 10° to 34° north latitude and from 105° to 130° east longitude, is all embraced in the eastern monsoon region, which is remarkable for abundant rains in summer.

"The camphor trees growing wild in the native range are usually most abundant on hillsides and in mountain valleys where there is good atmospheric as well as soil drainage. The temperature in the greater part of this region, which is partly within the tropics and partly subtropical, rarely falls below freezing. The tree is an evergreen, changing its leaves generally in April, and therefore the winter temperature is a factor of more importance than would be the case with a deciduous tree.

"RANGE UNDER CULTIVATION.

"Notwithstanding the comparatively narrow limits of its natural environment, the camphor tree grows well in cultivation under widely different conditions. It has become abundantly naturalized in Madagascar. It flourishes at Buenos Ayres. It thrives in Egypt, in the Canary Islands, in south-eastern France, and in the San Joaquin Valley in California, where the summers are hot and dry. Large trees, at least two hundred years old, are growing in the temple courts at Tokyo, where they are subject to a winter of seventy to eighty nights of frost, with an occasional minimum temperature as low as 12° to 16° F. The most northern localities in the United States, where the camphor tree has been grown successfully out of doors, are Charleston and Summerville, in South Carolina, Augusta, Ga., and Oakland, Cal.

"At Charleston, Sommerville, and Augusta the trees have withstood a minimum temperature of 15° F., but they have been protected by surrounding trees and buildings. At Mobile, Ala., the trees have grown and fruited in protected situations, while in exposed places they have been repeatedly destroyed by frosts. While the camphor tree will grow on almost any soil that is not too wet, it does best on a well-drained sandy or loamy soil, and it responds remarkably well to the application of fertilizers. Its growth is comparatively slow on sterile soils, but under favorable conditions it sometimes grows very rapidly. An instance is recorded of a camphor tree in Italy a foot in diameter and 90 feet high, eight years from the seed. Under ordinary conditions,

however, such a girth is not often attained in less than twenty-five years, and such a height is rarely attained in a century. Under favorable conditions an average of 30 feet in height, with trunks 6 to 8 inches in diameter at the base, may be expected in trees ten years from the seed.

"Uses of the Tree and its Products.

"The principal commercial uses of the camphor tree are for the production of camphor and camphor oil. Camphor is employed extensively in medicine. It enters into the composition of many kinds of liniments for external application. For liniment it is used especially in combination with olive oil. It is taken internally for hysteria, nervousness, nervous headaches, diarrhœa, and diseases affecting the alimentary canal. It is a specific in cases of typhoid fever and cholera. Camphor fumes have been used with success in cases of asthma. It has been used very extensively to keep insects out of furs, woolens, etc. In Japan, camphor and camphor oil are used in lacquer work. The oil is somewhat similar to turpentine, and could doubtless be used to advantage in varnishes and shellacs. It is now used in the manufacture of toilet soaps. In Japan and China it has been used for illuminating purposes, but it produces a smoky flame.

"Among the secondary uses of the camphor tree the most important is for ornamental planting. Its bright evergreen leaves, rapid growth, and long life make it valuable for this purpose. In Japan and China it has been the principal tree planted in the temple courts for many centuries, and in those countries it takes the place of the historic oaks of England. It has been extensively introduced into Southern Europe and South America for ornamental purposes.

"The wood, with its close grain, yellow colour, and susceptibility to polish, taking a kind of satin-like finish, is exceedingly valuable in cabinetwork, especially for making drawers, chests, and cupboards proof against insects. The leaves and young branches, although they have but a slight odour of camphor, are packed with clothing or scattered about unused rooms to guard against insects.

"The tree produces an abundance of berry-like fruits, which are used in Japan and China to make a kind of tallow. The fruits are greedily eaten by chickens and birds.

"Conditions of Successful Cultivation.

"For most of the secondary purposes, the camphor tree may well be cultivated wherever it can be made to live; but for commercial distillation, and for the production of wood for cabinet purposes, it must be grown under the most favorable conditions. The minimum winter temperature should not be below 20° F., and this minimum should be of rare occurrence. The soil, preferably sandy and well drained, should be irrigated unless there are abundant rains. Fifty inches of water during the warm growing season is desirable, and much more may well be used where the air is very dry.

"An abundance of plant food, rich in nitrogen, is required for rapid growth, but the kind of fertilizer that can be most profitably applied will vary according to the character of the soil in each locality. In the absence of definite information in this regard the kind of fertilizer producing most rapid growth of wood in the orange or in other fruit trees may be taken as an index.

"PROPAGATION.

"Camphor trees may be grown either from seed or from cuttings. They are usually grown from seed, as the trees fruit abundantly, and seedlings can be grown more easily than cuttings. The seeds are collected at maturity in October and November, and after drying are packed in sharp white sand or some similar material to keep them fresh until the time of planting in spring. About the last of March they are sown in drills in the seed bed.

"The soil of the seed bed should be a good sandy loam mixed with about one-third leaf mould. The seed bed should be kept moist, but not too wet, and should be shaded from the direct rays of the sun if the weather is warm. The best soil temperature for germinating camphor seeds is from 70° to 75° F. The temperature of the atmosphere may be ten degrees higher. The seedlings will grow well at higher temperatures, but are likely to lack vigour and hardiness.

"The seedlings may be grown in pots, which will facilitate transplanting at any time, or they may be transplanted in nursery rows early in April when one year old. Plants two years old are generally regarded as best for final planting. At this age they vary from 20 to 40 inches in height.

"PLANTING AND CULTIVATION.

"In Japan, where the law requires that a new tree shall be set out for every one cut, they are not generally set in straight orchard rows, but cultivation there is performed almost exclusively by hand labour. There are no records showing results of regular orchard planting, hence the distances at which trees should be planted must be determined by the size and form of the trees and the methods of cultivation and of procuring the gum. They may be set closely in rows about 10 feet apart, and alternate rows cut and reset every five years, thus producing bush-like plants of ten years' growth. They may be planted in checks 10 feet square, and alternate trees cut every ten or twelve years, or they may be planted in larger checks, and all of the trees be cut at the age of fifteen or twenty years.

"There are not sufficient data obtainable upon which to base definite statements as to the best methods of planting, or the age at which the trees may be cut with greatest profit. A recent English consular report from Japan states that 'although hitherto the youngest wood from which camphor was extracted was about seventy to eighty years old, it is expected that under the present scientific management the trees will give equally good results after twenty-five or thirty years.' Camphor of good quality has been produced in Florida from the leaves and twigs of trees less than twenty years old, 1 pound of crude camphor being obtained from 77 pounds of leaves and twigs.

"The trees will endure severe pruning with little apparent injury. One-third of the leaves and young shoots may be removed at one time without materially checking the growth of the tree. The largest proportion of camphor is contained in the older, larger roots; the trunk, limbs, twigs, and leaves containing successively a decreasing proportion. When the camphor tree is killed nearly to the ground by frost it sends up vigorous shoots from the base. It may be expected to do the same when cut, especially if cut late in the fall. Experiments are needed to determine whether this growth may be depended upon, or whether it will be more profitable to dig out the larger roots and set out new seedlings.

"DISTILLATION.

"In the native forests in Formosa, Fukien, and Japan, camphor is distilled almost exclusively from the wood of the trunks, roots, and larger branches. The work is performed by hand labour, and the methods employed seem rather crude. Different methods of distillation are employed in different districts, but those in use in the province of Tosa, in Japan, appear to be the most skilful. The camphor trees are felled, and the trunk, larger limbs, and sometimes the roots, are cut into chips by hand labour with a sharp concave adze.

"The fresh chips are placed in a wooden tub about 40 inches high and 20 inches in diameter at the base, tapering toward the top like an old-fashioned churn. The perforated bottom of the tub fits tightly over an iron pan of water on a furnace of masonry. The tub has a tight-fitting cover, which may be removed to put in the chips. It is surrounded by a layer of earth about 6 inches thick to aid in retaining a uniform temperature. A bamboo tube extends from near the top of the tub into the condenser. This consists of two wooden tubs of different sizes, the larger one right side up, kept about two-thirds full of water from a continuous stream which runs out of a hole in one side. The smaller one is inverted with its edges below the water, forming an air-tight chamber. This air chamber is kept cool by the water falling on the top and running down over the sides. The upper part of the air chamber is sometimes filled with clean rice straw, on which the camphor crystallizes, while the oil drips down and collects on the surface of the water. In some cases the camphor and oil are allowed to collect together on the surface of the water and are afterward separated by filtration through rice straw or by pressure.

"About twelve hours are required for distilling a tubful by this method. Then the chips are removed and dried for use in the furnace, and a new charge is put in. At the same time the camphor and oil are removed from the condenser. By this method 20 to 40 pounds of chips are required for 1 pound of crude camphor.

"The principles generally held to be essential in distilling camphor of good quality are :—(1) The heat must be uniform and not too great, producing a steady supply of steam; (2) the steam after liberating the camphor must not come in contact with metal, that is. the tub and condensing apparatus must be of wood.

"SUGGESTED IMPROVEMENTS.

"Many improvements upon the methods described can doubtless be made, tending both to a reduction in cost and an increase in the proportion of crude material obtained. Instead of an adze wielded by hand labor a machine similar to the 'hog' used for grinding up waste slabs in sawmills may be used to reduce camphor limbs to the requisite fineness for distillation. Better distilling apparatus can probably be devised. Thermometers may be introduced to determine the heat in the distilling tub, and the furnace may be so arranged as to permit better control and greater economy in fuel. Camphor and camphor oil are both slightly soluble in water, and the condensing chamber should be improved so as to recover the product that is being constantly carried off in the running stream which cools the chamber.

"OUTLOOK FOR FUTURE MARKET.

"The consumption of camphor in the United States, as measured by the importations, has been decreasing during the past ten years, while the price has been increasing.

"The tariff act approved July 27, 1897, imposes a duty of 6 cents per pound on refined camphor and leaves crude camphor on the free list, as heretofore.

"There has been an increase in importations of refined camphor, due to improved methods of refining and packing in Japan and to changes in the tariff, but this increase has been much more than counter-balanced by the decrease in importations of crude camphor. The decrease may be attributed to the following causes: (1) the exhaustion of the supply of the available camphor trees near the shipping ports; (2) the governmental restrictions on the trade in camphor in Formosa; (3) government taxes on the exportation of camphor from Formosa; (4) hostilities and wanton destruction of camphor stills by the natives in Formosa; (5) disturbances in the camphor-producing district of China; (6) the China-Japan war; (7) attempts by speculators to corner the market.

"These causes have increased the price of camphor, and this in turn has led to the introduction of substitutes. Menthol and other peppermint derivatives or compounds, carbolic acid and its derivatives, naphthalin, formalin, and insect-powder are now used for various purposes where camphor was formerly employed. Camphor has been manufactured artificially, at a cost leaving a margin of profit at present prices. It is therefore apparent that if the production of camphor from the trees is to be carried on with profit in this country, and the industry increased to any considerable extent, the price of camphor must be reduced to compete with the prices of substitutes now taking its place.

"Camphor has been obtained from several other plants not at all related to the ordinary camphor tree, but only two kinds, Borneo camphor and Blumea camphor, are of any importance commercially.

"Borneo camphor is obtained from the camphor tree of Borneo and Sumatra, *Dryobalanops aromatica*. It is deposited in clefts and hollows in the wood, and has simply to be taken out. This

camphor is comparatively rare, and the supply is consumed almost exclusively in China, where it is valued at from thirty to ninety times as much as ordinary camphor.

"Blumea camphor is obtained by distillation from *Blumea balsamifera*, a shrub growing in Burma and the Malay Peninsula. This is usually refined in Canton, whence about 10,000 pounds are exported annually. The source of this supply is abundant, and as the industry develops it is likely to enter more into competition with ordinary camphor. Neither of these plants can be grown in the United States, except possibly in southern Florida, without protection against cold.

"LYSTER H. DEWEY,
"Assistant in Division of Botany.

"Washington, D. C.,
"August 12, 1897."

There is a brief note on Borneo camphor wood in the *Kew Bulletin* for 1887 (September, p. 15), and a full account of Blumea camphor in the volume for 1895 (pp. 275–277, with plate, and also 1896, p. 73).

PRODUCTION IN CHINA.

Dr. Henry, the well-known Chinese Botanist, gives the following account in the *Pharmaceutical Journal* (March 6, 1897, p. 201) :—

The camphor tree, *Cinnamomum Camphora*, Nees, is indigenous to Japan, Formosa, and the central and southern provinces of China. It has been known to the Chinese from ancient times, but apparently until 300 or 400 years ago only as a valuable timber tree.

The camphor first in use was undoubtedly the Borneo camphor, and, as Hanbury says ("Pharmacographia," p. 512), "at what period and at whose instigation the Chinese began to manufacture camphor from the camphor laurel is not known." Hanbury further states that "the camphor of European commerce is produced in Formosa and in Japan, and we have no evidence that any is now manufactured in China, although very large trees, often from 8 to 9 feet in diameter, are common, for instance, in Kiangsi, and camphor wood is an important timber in the Hankow market" (pp. 512, 513). The latest references to camphor production ("Index Floræ Sinensis," ii., p. 371) further would confirm this, viz. : "Kwangtung, common around Pakhoi, but not utilised (Playfair)." Again, "Dr. Henry states that the wood is much used in Central China, but no camphor is extracted." Until a few years ago, then, no camphor was produced on the mainland of China, but it is interesting to note that the camphor industry has been started in China, and that there are signs that it will become important. This is all the more noteworthy as Formosa has become Japanese territory, and it seemed likely that camphor would become an entirely Japanese article, not a desirable contingency in view of the fact that the Japanese Government is striving to establish a monopoly in the

production of camphor in Formosa, and has, no doubt, in contemplation the creation of a large revenue by enhanced prices in the future.

For a history of the vicissitudes of the camphor trade in Formosa itself the reader is referred to the Chinese I.M. Customs' "*Decennial Reports* for 1882–91" (pp. 439, 466). *En passant*, this is a most valuable work for all questions connected with Chinese commerce, the history of the treaty ports, etc. It is replete with information of all kinds, and is illustrated with maps, plans, and diagrams.

The growth of the camphor industry on the mainland of China is shown by the following facts, taken from various China Customs' Yellow-books. From the *List of Chinese Medicines* (Misc. Series, No. 17), which gives details of the trade in drugs of all kinds for the year 1885, it appears that camphor was unknown as a product of the mainland, except in the single province of Chekiang, there being the small export that year from Ningpo of 25 piculs. Ningpo exported 32 piculs in 1889, 40 piculs in 1890, and none since apparently. The Customs' *Trade Reports* for the different years show the gradual appearance of camphor production in other parts. Kowloon exported 88 piculs in 1888, 106 piculs in 1892, 87 piculs in 1883. This was conveyed in junks, and its *provenance* is doubtful, but it was perhaps from the province of Kwangsi. Canton exported 122 piculs in 1893, 37 piculs in 1894, and 237 piculs in 1895. This is Kwangsi camphor. The Pakhoi *Trade Report* for 1894 states that the first record of the article was in 1892; in 1893 the export was 23 piculs, which increased to 128 piculs in 1894, and "it comes from Lu-chuan, near Yu-linchou, and is likely to grow in importance, as plantations in that and other places in the neighbourhood are coming to the bearing age." In the Pakhoi *Trade Report* for 1895, the export is given as 596 piculs, and the writer says that this gratifying increase is due to the extended cultivation in Kwangsi. In Formosa only old and enormous camphor trees are utilised, and I am inclined to doubt of the existence of camphor plantations in Kwangsi; the camphor produced is more likely to be from old forest trees. The Chinese, at any rate, did not plant any trees with a view to the manufacture of camphor.

In 1895 the exports of camphor from different Chinese ports were:—Foochow, 187 piculs; Amoy, 668 piculs; Canton, 237 piculs; Kowloon, 68 piculs, and Pakhoi, 596 piculs. In the Fukien province there are large forests, and camphor trees abound. Some years ago a party of Japanese went into the interior of Fukien to manufacture camphor, but nothing came of this attempt. The Foochow export is probably the product of this province, but that of Amoy is doubtful, as it may be Formosan camphor smuggled over to the mainland in junks. The export of the other three ports is produced in the Kwangsi province, and this will probably grow into large figures if camphor continues high enough in price to encourage the Chinese in its manufacture.

To sum up, the production of camphor on the mainland of China is an affair of the last few years. It began in Chekiang, but has practically ceased in that province. In Kwangsi it commenced a short time ago, and promises to develop into importance. The Fukien product is only trifling so far.

Production in Formosa.

The following is extracted from the Foreign Office *Report on Trade in Japan* for 1897. (Misc. Series, 440, pp. 71–72.)

The trade in camphor will probably undergo some modification. Camphor trees are not found in that part of the island (of Formosa) occupied by Chinese settlers. They occur only in the country of the aborigines, or upon the immediate border, and up to the present time the destruction of trees has been carried on in the most wasteful manner. The mode of obtaining supplies of camphor was for foreign merchants through Chinese agents to advance money to the savage chiefs for permission to cut down trees. The stills were erected at the expense of the foreigners, who paid a tax of 8 dol. a still to the Chinese authorities, and a local tax of 10 dol. on each picul (133 lbs.) of camphor produced. When the island was ceded to the Japanese the privileges which foreigners had enjoyed under Chinese rule, of having these camphor establishments in the interior, seemed likely to be withdrawn by the Japanese Government. The Chinese treaty, much more than the Japanese, gives freedom of travel and trade to the foreigner; and if the limitations imposed by our treaty with Japan had been strictly enforced in Formosa, foreigners would have had to retire to the treaty ports. They would have been debarred from distilling or purchasing camphor in the interior, and they would have suffered heavy losses in abandoning the capital already sunk there. Considering that the present treaty had only two more years to run, the Japanese Government has consented to let matters remain *in statu quo*; and when under the new treaty, foreigners obtain a right to settle anywhere in the interior, they will be able to distil as much as they like. But there is also a probability that the preparation of camphor will be made a Government monopoly. With the Formosan supply under its control the Japanese Government could almost secure a monopoly of the camphor trade, for Japan and Formosa are almost the only sources of supply; and advantage may be taken of this to put Formosa's finances on a satisfactory basis. The lands where the camphor trees grow are not privately owned as is the best portion of Formosa's fertile plains, so the Government could appropriate the camphor producing districts without interfering with vested interests.

The following further information is given in the Report on the Trade of Tainan for 1897 (*Foreign Office Annual*, 2149, pp. 5–6) :—

The camphor trade has, so far as concerns foreign merchants in South Formosa, almost entirely stopped, owing, among other causes, to the disturbed state of the country and the difficulty and danger of sending money into the camphor districts. The roads continued throughout the year to be infested with armed robbers, who, on the approach of the military or police, fled to the hills (where it was, apparently, impossible to pursue them), only to reappear at the first favourable opportunity. Robberies became of such frequent occurrence that no foreign or native merchant would venture to send money into the interior. The Japanese authorities, on their part, did not see their way to allow the tax to be paid in the treaty port on arrival of the camphor, and business was consequently brought to a standstill.

In the raids and skirmishes, too, which have taken place in the camphor-producing districts, numbers of stills have been destroyed. Their destruction was, perhaps, inevitable, but as they were almost entirely erected with money advanced or loaned by foreign merchants in South Formosa, the losses incurred by the latter have been very considerable. It is estimated that not one-third of the stills in existence two years ago, in which foreigners in South Formosa are interested, are now available for camphor production.

The hope expressed by Her Majesty's Consul in last year's report, that the camphor trade might revive and assume large proportions, has not been realised ; in fact, far from this being the case, the camphor export business, as far as South Formosa is concerned, has now (April, 1898) almost stopped.

These remarks, of course, apply exclusively to the export of camphor by foreign merchants in this district (South Formosa) who have in the past invested considerable sums of money in the business. The production of camphor in the districts of Rinkipo and Shu Shu (Hunlin and Chip Chip), the principal districts whence the drug came to South Formosa, still, I am informed, continues, though to nothing like the same extent as formerly ; but all the camphor so produced finds its way viâ the port of Rokko (Lokkang) to Tamsui, whence it is shipped to Hong Kong and Japan. The roads north of Rokko are said to be perfectly safe, so that dealers can reach the neighbourhood of Chip Chip and buy up any camphor that, under other circumstances, should and would go to the foreign firms in Tainan, with whose money the business was first started. Things may remedy themselves in course of time, but the outlook at present is certainly not very bright.

The following table shows the export of camphor from this port since, practically, the commencement of the trade :—

Years.	Number of Boxes Exported.
1892	4,315
1893	6,691
1894	12,157
1895	10,145
1896	8,001
1897	3,057

NOTE.—One box contains about one picul (133⅓ lbs.) of camphor.

PRODUCTION IN CEYLON.

The cultivation of the camphor tree has attracted some attention in Ceylon. But, as will be seen from the following correspondence which has appeared in the *Ceylon Observer*, both it and the production of the drug are in the experimental stage.

SUPERINTENDENT, HAKGALA BOTANIC GARDENS, TO EDITOR "CEYLON OBSERVER."

Botanic Gardens, Hakgala,
April 6th, 1898.

DEAR SIR,

REFERRING to your question as to what is being done with camphor cultivation in Ceylon, I may add the following to what I wrote you on the 11th of February last. Wishing to satisfy myself that solid camphor exists in the leaves and twigs of even very young plants, I sent a small bundle of prunings, from plants planted out at the end of 1895, to Mr. S. A. Owen, of Messrs. W. Jordan & Co., of Lindula, who had very kindly undertaken to make the experiment for me. I am pleased to state that he has been very successful in extracting solid camphor from them ; and as this is of general interest to planters, I shall be much obliged if you will be good enough to publish Mr. Owen's letter in an early issue of your paper.

The prunings from an average plant 28 months' old, as grown here, weigh from 10 to 12 lb.

I have a good many plants that want pruning, and if applied to before the end of this month, April, I shall be very glad to supply 10 or 20, or 35 lb. prunings to any person wishing to make the experiment for himself.

I am, &c.,
W. NOCK.

MR. S. A. OWEN to SUPERINTENDENT, HAKGALA BOTANIC GARDENS.

Talawakele, March 30, 1898.

DEAR MR. NOCK,

THANKS for the parcel of camphor prunings duly received. I have made several experiments. The following is the account of method employed and results :—

* * * * *

A gallon iron kettle was packed with 1½ lb. of leaves and small twigs, together with about two pints of water. The cover of the kettle was luted on and the spout fitted with a cork, while a long glass tube proceeded from the cork to a condenser. Applied heat gradually, and kept it up for five hours. At the end of this time the sides of the condenser were coated with camphor, and small lumps were floating in the water which distilled over. All the camphor was collected carefully and dried between bibulous paper (to absorb most of the adhering oil). It then weighed 55 grains, which is equivalent to 12 ounces to the cwt. or 15 lb. to the ton.

I think the results very encouraging, as the leaves and young parts of the camphor tree contain but a very small proportion of camphor compared with the trunk-wood. Indeed, I believe that in Formosa and other camphor-producing countries, it is customary to altogether discard the branches and leaves and use the main-wood only.

I should think that planters who have young camphor trees coming on here in Ceylon would find it well worth their while to utilise their prunings—especially if firewood is available and cheap, as this latter item would be practically the only expense, beyond the small amount of labour required and the initial expense of a still, which latter could be easily extemporised out of almost any kind of large iron vessel to which heat could be applied. As the camphor tree is a long while coming to maturity, considerations of this kind ought to be borne in mind.

I have pleasure in enclosing a small sample of the camphor obtained. As you will see, it has a rather dirty appearance, due to unavoidable impurity and the sample smells of camphor oil, but these are easily got rid of in the process of refinement. I also enclose a small sample of the same camphor partly purified by sublimation.

You are, of course, very welcome to make what use you like of this account of these small experiments, whether by publication or otherwise. No doubt it would be encouraging to those who have gone to the expense of planting up camphor trees to know that there is camphor in our locally grown trees. I have heard of one or two misgivings as to whether the soil and climate here would favour the formation of camphor in the tree.

Yours faithfully,
(Signed) S. A. Owen.

DCXLIX.—PERUVIAN RUBBER.

Up to the present time little or nothing has been known botanically with respect to Peruvian rubber. Our knowledge, in point of fact, was pretty well limited to the following statement reprinted in the *Kew Bulletin* for 1892, p. 69, from a valuable article in *The India-rubber and Gutta Percha and Electrical Trades Journal*:—

"There comes from Peru, at the sources of the Amazon and its tributaries, a rubber resembling the Nicaragua Sheet, and called Caucho. This rubber is very wet, and consequently shrinks very much, which is a serious drawback. It is considered a good strong rubber, and it is utilised to a considerable extent by the boot and shoe manufacturers."

The following correspondence supplies the first information as to the actual source of Peruvian rubber.

Foreign Office to Royal Gardens, Kew.

The Under Secretary of State for Foreign Affairs presents his compliments to the Director of the Royal Gardens, Kew, and is directed by the Secretary of State for Foreign Affairs to transmit to him the accompanying paper noted in the margin, respecting a tree which grows in Peru and produces the quality of India-rubber known as "Caucho."

Foreign Office,
May 17, 1899.

MR. CONSUL CHURCHILL to FOREIGN OFFICE.

Her Majesty's Consulate, Pará,
MY LORD, April 28, 1899.

IT may interest those concerned to know that the tree which produces the quality of India-rubber exported from Peru, through Pará, under the name of Caucho, has recently been determined by Monsieur Huber, a botanist, who is on the scientific staff of the Museum of Pará.

Monsieur Huber lately visited the Ucayali region in Peru, and discovered that the tree was a *Castilloa*.

He will shortly be able to decide, by comparison, whether it is the same as the *Castilloa elastica* of Central America, or a species of the same genus. It had been surmised previously that the tree might be a *Castilloa*, but I believe Monsieur Huber is the first authority who has settled the point. With this knowledge it results that the distribution of the *Castilloa* is wider than was previously thought to be the case.

"Caucho" is also produced in the neighbourhood of the Bolivian tributaries of the River Amazon, and from parts near the said tributaries that pass through Brazilian territory.

A sample of "Caucho" exists, in the Museum of this City, that came from the banks of the River Tocantins.

It is said that "Caucho" is also produced near Macapa and Mazagao, on the north bank of the River Amazon, near its estuary.

A recent statistical return on the exports of the State of Pará reports that this produce was exported in small quantities (altogether about 10 tons) from Aveiros (River Tapajos), Santarem, Alemquer and Obidos on the River Amazon. The total shipments of "Caucho" from Amazonian ports amount to about 2,000 tons annually.

Monsieur Huber describes the process of tapping as follows:— "The trunk is almost severed in two at a distance of about 3 feet from the ground, and the tree is allowed to fall in such a manner that it is supported in an inclined position by its branches, and still holds on to the part that is left standing. The sap is collected and poured into a hole made in the ground, and is coagulated by means of the juice of certain local lianas. The natives state that this is the best method of tapping, and that if the trees were treated in the same manner as the Heveas they would soon be destroyed by insects which would attack them where the bark would be injured by incision. This may be only an excuse for unnecessary destruction which might be avoided. However, it must be considered that as these trees grow far apart from each other in their native state it must be inconvenient, if not impossible, to attend to more than one tree at a time.

Trees that have been tapped in the manner described do not survive the operation. In the course of time their places are, no doubt, taken by young trees that grow from seeds.

The Amazonian Castilloas are found on elevated land that is beyond the reach of floods, whereas the Heveas thrive best in the lowlands that are periodically inundated by the River Amazon.

I have, &c.,
(Signed) WM. A. CHURCHILL.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

ROYAL BOTANIC GARDENS, KEW, to FOREIGN OFFICE

Royal Gardens, Kew,
May 23, 1899.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of May 17, transmitting a copy of Consul Churchill's report on a kind of India-rubber exported from Peru, through Pará, under the name of Caucho.

2. Caucho, of which Caoutchouc is probably an expanded form, has been hitherto identified with "India-rubber" *par excellence*, the produce of one or more species of *Hevea* indigenous to the basin of the Amazons, and exported from Pará. According to the information now received, the Caucho tree of Peru is a *Castilloa*. One or more species of this genus produces the india-rubber of Central America. In South America *Castilloa* has been known to extend as far as Ecuador, where it is called Jebe, otherwise Jeve or Heve. According to Aublet this latter name was given in Northern Ecuador to a species of *Hevea*, and in founding that genus he derived its name accordingly. In the Amazon basin the name for the species of *Hevea* is "Seringa," and in Central America for those of *Castilloa* "Ule" or "Tunu" (see *Kew Bulletin*, 1898, pp. 141, 142). Perhaps in Western South America the names Caucho and Jebe are applied indiscriminately to rubber-producing trees.

3. According to a report by Mr. D. B. Adamson, H.B.M. Consul at Iquitos, dated December 24, 1898, and published in the *Transactions of the Liverpool Geographical Society* for the same year, Peru has two kinds of rubber-producing trees: Caucho, which appears to belong to *Castilloa*, and Jebe to *Hevea* (pp. 39–40). Both Mr. Adamson and Mr. Churchill agree that the rubber is extracted from the Caucho tree by felling. The Jebe is always tapped. The former process results in a district being "worked out." In consequence, according to Mr. Adamson, "many of the 'Caucheros' [or rubber collectors] are working on Brazilian rivers, where the supply is yet more plentiful."

4. It is not, however, necessary to fell the *Castilloa* trees to collect the rubber. The method of tapping is minutely described in a report by the United States Consul-General Beaupré, published in the United States *Consular Reports* for May, 1899, pp. 147–151. The estimated yield per tree is much smaller than that given in Sir Henry Derling's report, as to which I addressed some enquiries to the Foreign Office in my letter of April 14, 1897.

I am, Sir,
Your obedient Servant,
W. T. THISELTON-DYER.

The Under Secretary of State
for Foreign Affairs,
Foreign Office, Downing Street, S.W.

EXTRACT from Report by Consul D. B. Adamson in *Transactions Liverpool Geographical Society*, 1898, pp. 39–40.

"As you are aware, rubber is the chief article of export, and hitherto has been practically the only one of any importance. Its extraction from the trees and preparation for the market is

principally in the hands of Peruvians, assisted by Indian labour. The work is rough, and the hardships connected with gathering are very great. The kind exported from here in past years has been chiefly Caucho, the gatherers of which are known as Caucheros. The wasteful method adopted is, however, beginning to tell adversely as far as this particular class of rubber is concerned. This can be understood when it is explained that Caucho is gathered by cutting down the trees to collect the sap. As it is said that it takes from 15 to 20 years to arrive at a fit state to be worth cutting down, it can easily be seen that those in accessible positions are continually growing scarcer. As none are planted to supply the loss, when a district has been worked thoroughly, nothing can be done till nature re-asserts herself. Of course the young trees are constantly growing, and places that have been worked out will, in course of time, yield again in quantity, but meanwhile the yield in them is so small that it is not worth while to collect. It must be remembered that it is only possible to collect near the rivers, on account of the difficulties of transport overland. In the interior, or rather inland from navigable waters, probably there are plenty of Caucho yielding trees still, for there are vast tracts of land absolutely unexplored. These, however, are either inaccessible or would be unremunerative to work.

"It is much to be desired that some more economical method of gathering Caucho could be introduced, one which would allow the sap to be got without destroying the trees, as the timber is worthless. This is done in other parts of the world where more economical conditions prevail. At present many of the Caucheros are working on Brazilian rivers, where the supply is as yet more plentiful. The heavier export duties of Brazil will cause the Caucheros to return to Peru, when, in the absence of Caucho, they will devote themselves either to its cultivation, which is scarcely likely to any large extent, or gathering the other chief kind of rubber, known as Jebe.

"This is of considerably higher value than Caucho, being worth from 70 per cent. to 90 per cent. more, according to ruling prices here. The method of gathering it, however, has not been so well understood by the native labourers, or they have not found the work so much to their taste.

"In gathering Jebe the tree is simply tapped, the sap being collected in small pans, which are emptied daily or periodically. This class of rubber collecting is conducted mainly by settlers, as distinguished from the wandering Caucheros."

To complete the available information on the subject, the following extract from Mr. Consul Adamson's Report on the Trade of Iquitos is reprinted from the Foreign Office *Report on the Trade and Finances of Peru* (1898, p. 13, No. 2,298) :—

"Rubber forms the chief article of export. Most of it goes to Europe, and very little attention is given to other productions of the district. The chief classes are Caucho and Jebe, the present prices of which may be taken as 30 and 50 soles per arroba of 15 kilos. respectively. It may be stated that these figures show a marked increase during the year. The average for 1898 is given as 26 soles per arroba for Caucho and 49 soles per arroba

for Jebe. A slightly lower grade of this may be named as about 2 soles lower in price. There is also Sernamoi or scrap rubber, both of Jebe and Caucho, the average price of which during the year is given as 37 soles per arroba. The total value of all classes during the year is given as £202,916, as compared with £206,047 the year before, the quantities being 1,140,523 kilos. in 1897, and 829,935 kilos. in 1898. This falling-off may be accounted for by the increasing inaccessibility of the Caucho bearing trees, those within easy reach having become scarce owing to the wasteful method of gathering the gum. The process has been to cut down the tree instead of merely tapping it.

"The trees are all wild, and it will take some years to allow them to grow sufficiently to gather from again. Another reason for the falling-off last year, and one of perhaps equal weight with the former, is that a large number of the Caucheros, or rubber gatherers, have gone to the Jurua and other Brazilian rivers, whence, however, there are grounds for saying the bulk of them will return. As a rule the Caucheros are not familiar with the collection of Jebe, or fine rubber, but they are learning, and when they return to Peru will probably devote more attention to it.

"The proportion of this to Caucho has considerably increased lately. Jebe is gathered by tapping the trees, a certain number of which are placed under the control of a gatherer, who visits them daily to collect the yields."

DCL.—EUCALYPTUS TIMBER FROM WEST AUSTRALIA.

The use of Jarrah timber (*Eucalyptus marginata*) and Karri (*Eucalyptus diversicolor*) for wood-pavement has been noticed on several occasions in the *Kew Bulletin* (1890, p. 188 ; 1893, p. 338 ; 1897, p. 219).

The following correspondence, which refers to the various purposes to which these and other West Australian woods can be applied, is published for general information :—

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street,
September 14, 1898.

SIR,

I AM directed by the Secretary of State for the Colonies to transmit for your information a copy of a despatch from the Governor of Western Australia, enclosing a Report upon the Sixth Annual Conference of Producers of the Colony.

I am, etc.,
(Signed) H. BERTRAM COX.

The Director,
Royal Gardens, Kew.

GOVERNOR OF WESTERN AUSTRALIA TO COLONIAL OFFICE.

Government House, Perth,
June 30, 1898.

SIR,

* * * * *

3. During the months of last year from August to November I thought it desirable to visit the principal agricultural districts of the Colony that I might be able to give you, as I promised before leaving England, an impartial account of the condition and prospects of the Colony in this respect. You will, I am sure, recognise the value and importance of feeling assured that, apart from the gold industry, the Colony has a future before it of no uncertain character in the development of the natural resources of the soil.

* * * * *

5. I need only add a few words about the timber industry, which did not come within the scope of my address, but the prospects of which did not escape my attention during my travels.

Jarrah and Karri timber are the principal products of this character. The forests of both varieties in the South and South-West of the Colony are very extensive, and have not been fully explored. It is said they are inexhaustible, but, judging by what I have seen, I am by no means of this opinion. In those districts I have seen, in which timber is being felled and exported for home or foreign use, the waste is almost more than the mind of man can conceive. I can understand that it does not pay to lead bad timber to market, but greater care might be taken in examination before felling timber indiscriminately, and simply on the chance of its being good enough for market. It is said that where one tree is felled there a dozen spring up to take its place. This is true, but the time taken before the young trees mature sufficiently for market purposes robs any such statement of all its importance and sufficiency.

6. So far as the values are concerned of these two timbers, Jarrah and Karri, I understand both are being largely exported to the United Kingdom for wood pavements, and the former especially for railway sleepers, dock staging and wharfs. I think the Western Australian Jarrah has a great future before it. It fills all the essential conditions which are necessary to make it a first class railway sleeper, and as the ever-increasing weight and speed of trains in the United Kingdom will require a heavier and more rigid road in proportion to the increased weight of steel rails, it is likely to find a lively market in the near future. At the same time it is not superior to the South Australian Red Gum. The durability of both will be, even on the heaviest gradients and at the highest rates of speed with ordinary train loads, from 15 to 21 years against 7 to 10 years of the English sleepers commonly used hitherto. For piles and staging, and wharf and dock gates, Jarrah seems impervious under water to all attacks of wind and weather and marine life, and I should not hesitate to use it with as great readiness as Greenheart. I feel some doubt as to its suitability for wood pavement. The cleavage with the grain is so easy that I think the cost of maintenance and repairs will be heavy, and the

dust in dry weather, owing to the large amount of acetic acid in this timber, will be found to be peculiarly painful and irritating to the eyes.

7. Karri timber below water is practically useless, rotting very readily, and if used for wood pavement in a damp climate like England, is foredoomed to failure unless the water is constantly swept off it. Used above water for structural purposes, that is, free from contact with the ground, its life seems to be eternal, being practically impervious to ants and worms, and not so inflammable as Jarrah. For structural purposes in large buildings I should regard it as quite equal to the best old seasoned English oak.

8. There are other valuable woods, such as the Jam-wood (unrivalled for fencing) and Sandal-wood ; but the supply of both is limited, and of the latter almost exhausted by the demands of the Chinese market.

9. I am glad to be able to add, in conclusion, that we are having, so far, an abundance of rain, and the agricultural prospects were never better. In view of the recent largely increased settlement upon the land, this is a great blessing. A contrary condition would have caused at a critical moment almost irremediable disappointment to a large number of new settlers, who look to the next harvest to reap the first return they have had for their labour and capital.

I have, &c.,

The Right Honourable (Signed) GERARD SMITH.
J. Chamberlain, M.P.
&c., &c., &c.

ROYAL GARDENS, KEW, TO COLONIAL OFFICE.

Royal Gardens, Kew,
SIR, September 20th, 1898.

I HAVE the honour to acknowledge the receipt of your letter of September 14th (17240), transmitting a despatch from the Governor of Western Australia, dealing principally with Jarrah and Karri timber. I propose to publish for general information in the *Kew Bulletin* so much of the despatch as relates to this subject.

2. The facts in our possession do not, however, entirely confirm the statements of the Governor as to the difference in the qualities of the two woods. I enclose a memorandum on the subject from the Keeper of the Museums.

3. The Timber Museum of the Royal Gardens contains a magnificent log of Jarrah, weighing nearly five tons, which was shown at the Colonial and Indian Exhibition. It also contains a log of Karri exposed between high and low water-mark in Western Australia for forty-two years, and still in good condition.

4. I enclose copies of the numbers of the *Kew Bulletin*, in which the use of Jarrah and Karri for wood-paving is discussed. These would probably interest the Governor if transmitted to him.

I am, &c.,
(Signed) W. T. THISELTON-DYER.

H. Bertram Cox, Esq.,
Colonial Office, Downing Street, S.W.

[Enclosure.]

JARRA AND KARRI TIMBERS.

The woods of Jarrah (*Eucalyptus marginata*) and Karri (*E. diversicolor*) are both much used, and advertised by rival firms, for road-paving, but Jarrah appears to be most in demand.

"The cleavage with the grain" of Jarrah, spoken of in paragraph 6 of Governor Smith's letter, does not appear to be possible judging from the blocks contained in the Museum, which are typical of ordinary road blocks used in London. Nor do I remember having seen this objection raised; indeed, there seems to be but little difference in the twisted grain of either of the woods Jarrah and Karri.

The South Australian Red Gum, referred to also in paragraph 6 of the above letter, is apparently *Eucalyptus rostrata*, the durability of which Maiden describes as "perhaps having a rival only in *E. marginata*."

J. R. J.

19th October, 1898.

DCLI.—MISCELLANEOUS NOTES.

MR. ALEC ARTHUR, a member of the gardening staff of the Royal Gardens, has been appointed by the Municipal Council of Shanghai, Superintendent of Parks, Recreation Grounds, etc., in that town. He leaves for China on May 18th.

MR. JOHN GOSSWEILER, recently a member of the gardening staff of the Royal Gardens, has been engaged by the Portuguese Government for the curatorship of a Botanic Station in Loanda, Angola. He leaves for Africa in May.

Linnean Medal.—The President and Council of the Linnean Society awarded the Linnean Medal (which is given bi-annually) to MR. J. G. BAKER, F.R.S., late Keeper of the Herbarium and Library of the Royal Botanic Gardens, "for his services to Botany during a long series of years, especially his writings on ferns and petaloid monocotyledons, serviceable alike to botanists and cultivators." The presentation took place at the Anniversary Meeting on May 24th.

Rescue from Drowning.—A gallant feat which has not been noticed in its place must not pass unrecorded. On February 24th, a visitor attempted suicide by plunging into the pond in front of the Palm-house. Fortunately two young gardeners were passing at the time on their return to work after the dinner hour.

The man had already sunk beneath the surface, when one of the young gardeners, W. C. Fishlock, jumped in, swam out and succeeded in bringing the man to land. C. G. Girdham, who had received instruction in a St. John's Ambulance class, was able to induce artificial respiration, and the man was eventually sent to his home.

The circumstances having been reported to the Royal Humane Society by Her Majesty's First Commissioner of Works and Public Buildings, the certificates of the Society were awarded to the young men, and presented to them by the Director on March 16th.

Botanical Magazine for April.—The variety of the familiar *Impatiens Roylei* which is the subject of plate 7647 appeared in the shrubberies of Sir J. D. Hooker's garden at Sunningdale, three or four years ago. Sir Joseph is unable to explain how it was introduced into his garden, and whence it came. It is assumed that this plant, which differs from the type in being more robust and in having larger inflorescences of pale rose-coloured flowers, is a native of the Himalayas. The specimen of *Cereus paxtonianus*, which species includes *C. Cavendishii*, was acquired by purchase. The Kew plant has a slender, erect stem about four feet high. Its flowers, which were produced for the first time at Kew in September, 1898, are white, and three to four inches in diameter. *Silene Fortunei*, from China and Formosa, resembles superficially the *Lychnis Flos-cuculi* of our meadows. The seed from which the specimen figured was raised was collected in Shensi by Father Piccoli, of the Jesuit Mission in Hankow, and were received at Kew through G. Murray, Esq., F.R.S., Keeper of the Botanical Department of the British Museum. A plant of *Yucca elata*, a native of the South-Western United States, was purchased in 1893, and flowered in 1896. This specimen has now a trunk about a yard long. The flowers are two inches long, and white. *Incarvillea variabilis*, from Western China, has elegant foliage and loose racemes of bright rose-purple flowers. Seeds of this plant were sent to Kew by Mr. W. Thompson, of Ipswich.

Botanical Magazine for May.—*Nicotiana sylvestris* is a robust species from Argentina, quite recently introduced into cultivation. The large leaves resemble those of *N. tomentosa*, and the flowers those of the well-known *N. alata*, (*N. affinis*). The Kew plants were raised from seed communicated by Messrs. Dammann & Co., of Naples. *Cyrtanthus parviflorus* is allied to *C. angustifolius*, having, however, smaller, more brightly coloured flowers. Bulbs of this plant, which is a native of the Cape, were presented to Kew by E. H. Woodall, Esq., of Scarborough. *Alnus nitida* occurs at elevations of 4,000 to 9,000 feet in the Western Himalaya. This, and *A. nepalensis*, a species as yet not introduced into English gardens, are the only representatives of the genus in the Indian flora. Seeds of the former were sent to Kew by the late R. Ellis, Esq., in 1882. *Dahlia maximiliana* is a little-known species.

though it was exhibited at a show of the Royal Horticultural Society in 1879. Its beautiful, mauve-coloured flowers are produced during the winter months. The specimen figured was furnished by Thomas Hanbury, Esq., F.L.S., from his magnificent garden at La Mortola. *Veronica Dieffenbachii*, from the Chatham Islands, is allied to *V. speciosa* and *V. macroura*. The drawing was made from a specimen communicated by R. Lindsay, Esq., of Kaimes Lodge, Murray Field, Midlothian.

Hooker's Icones Plantarum.—The last part of the sixth volume of the fourth series, containing plates 2,572 to 2,600, was issued in March, 1899. Plates 2,572 to 2,574, illustrating the genus *Hevea*, belong to the previous part, the original impression having been totally destroyed by fire. They illustrate the floral structure and the seeds, both dormant and germinating, of some of the principal species. One more new species of *Hevea* is figured in this number, supplemented by a plate of drawings selected from some unpublished figures in the British Museum. *Ficus laurifolia*, Lam. (plate 2,578), is a handsome species cultivated in Italy and Egypt, the origin of which is uncertain. Three more plates represent as many species of *Eryngium*, natives of Central America, where the genus exhibits a great and widely different variety of forms. Plate 2,584 represents the male flowers and inflorescence of the singular pandanaceous genus *Sararanga*, prepared from material collected in Solomon Islands by the Rev. R. B. Comins. *Limacia monilifera* is another interesting plant from the same source. This number also contains some of the high-level plants of recent discovery in Tibet and British New Guinea, and further illustrations of the marvellously rich flora of Western China. A kind of sarsaparilla cultivated in Jamaica is figured under the name of *Smilax utilis*.

Kew in the Colonial Office List.—At the request of the Editors, the following brief account of Kew has been furnished for this publication. It appears on page 19 of the issue for the current year :—

"Royal Botanic Gardens, Kew.

"Kew as a scientific establishment dates from 1759, when a Botanic, or, as it was then called, a Physic, Garden was established by the Princess Augusta of Saxe-Gotha, Dowager Princess of Wales.

"It was energetically maintained by her son, George III., with the scientific assistance of Sir Joseph Banks, who was virtually for the greater part of his life Director. Under his advice collectors were sent to all parts of the world. The first New Holland plants were introduced during Cook's voyages, 1768–1780. At Sir Joseph Banks' instance the system of inter-colonial exchange was commenced, which has been maintained ever since. The most memorable undertaking of this kind was the voyage of

the 'Bounty' (1787) for the purpose of introducing the bread-fruit tree from the South Seas into the West Indies. Nelson, the Kew collector, was amongst those sent adrift by the mutineers, and eventually died of the exposure. Another Kew gardener, James Hooper, who had been attached to Lord Amherst's Embassy to China, remained in Java, and was from 1817–30 Hortulanus of the celebrated Dutch Colonial Botanic Garden at Buitenzorg, which he helped to create.

"Both George III. and Sir Joseph Banks died in 1820, and the colonial and other work of Kew languished, though it was not absolutely abandoned, during the reign of George IV. and William IV. In 1838 the abolition of the whole establishment was contemplated by the Government. Public opposition led to the appointment of a Treasury Committee, the report of which was presented to Parliament in 1840. The following paragraphs briefly defined the functions of the reorganised establishment :— 'A national garden ought to be the centre round which all minor establishments of the same nature should be arranged . . . From a garden of this kind Government would be able to obtain authentic and official information on points connected with the founding of new colonies; it would afford the plants there required without its being necessary, as now, to apply to the officers of private establishments for advice and assistance.'

"These recommendations having been adopted by the Government, Sir W. J. Hooker, F.R.S., was appointed Director in 1841 to carry them out. A close connection between Kew and the Colonial Office immediately sprang up. A scheme for a complete series of Colonial floras was sanctioned in 1856, and has been steadily prosecuted. Kew serves to a large extent as an advanced horticultural school. Special attention is given to the preparation of gardeners for Colonial service. Some 60 men trained at Kew are now in official employment in different parts of the Empire.

"Relations with the botanical institutions of the self-governing Colonies are maintained by semi-official correspondence. With those of Colonies more directly under the control of the Colonial Office, the connection is closer.

"Colonial botanical institutions fall roughly into three classes. Those of the first class are usually, like Kew, administered by a scientific Director; those of the second class by a skilled Superintendent; the third class consists of Botanic Stations. These last are small and inexpensive gardens, devised in 1885, in order to afford practical instruction in the cultivation of tropical crops, and were intended to develope the agricultural resources, at first, of the smaller West Indian Islands, and subsequently (1887) of British Possessions in Tropical Africa. Each is in charge of a Curator, who is a gardener trained at Kew.

"The principal members of the Kew staff are :—

"Director : Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E., LL.D., F.R.S.

"Keeper of the Herbarium and Library : W. B. Hemsley, F.R.S.

"Honorary Keeper of the Jodrell Laboratory : D. H. Scott, Ph.D., M.A., F.R.S.

"Keeper of Museums : J. R. Jackson, A.L.S.

"The most important Colonial botanical institutions in intimate relation with Kew are :—

"Ceylon.—Director of Royal Botanic Gardens : J. C. Willis, M.A.

"Straits Settlements.—Director of Gardens and Forest Department : H. N. Ridley, M.A.

"Jamaica.—Director of Public Gardens and Plantations : William Fawcett, B.Sc.

"In 1898, in accordance with the recommendations of the West India Commission, a Special Department of Agriculture was created for Barbados, the Leeward and the Windward Islands, and was placed under the charge of a Commissioner, with headquarters at Barbados.

"Commissioner of Agriculture at Barbados : D. Morris, C.M.G., D.Sc., M.A."

Completion of the Temperate House.—On Bank Holiday, May 1, the North Wing, the last uncompleted portion of the Great Temperate House, was thrown open to the public. The completion of the South Wing was announced in the *Kew Bulletin* for 1897 (pp. 333, 334). The *Building News* for February 12 and 19, 1897, contained a full account of it, with detailed drawings.

Some particulars may now be given of the structure as a whole, and of the history of its erection. The first scheme of the house was projected by Sir William Hooker, in 1855. The design, as now practically completed, was made by Decimus Burton, who also designed the Palm House. The *Builder* for January 12, 1861, contains a ground plan and elevation, with detailed particulars of the whole structure.

In 1860 Her Majesty's Office of Works entered into a contract with Messrs. Cubitt "to construct the centre of the new Temperate House in Kew Gardens and the octagons for the sum of £28,858." The actual cost appears to have been approximately about £29,000. The roof is of wrought-iron, the columns of cast-iron. At present prices it is estimated the building would cost one-third more. On the other hand, a lighter construction would have been employed, and the cost might not have exceeded £30,000.

In 1861 the octagons at either end were finished. Taking *outside* measurements for these (as for all other portions of the structure) their diameter is 54 feet.

In 1862 the central part of the building was completed : it is 216 feet long by 140 feet wide, and (inside) 60 feet high. A raised terrace was made for the building, and space provided on it for the two wings. Their erection was, however, indefinitely postponed in 1863, although the foundations had been partially laid ; part of the iron-work lay in the contractor's yard for many years, and was eventually broken up.

In 1894, thirty-one years later, the erection of the South Wing was sanctioned, and in 1897 that of the North. The former was completed in that year and the latter in the present. A period of thirty-nine years has, therefore, elapsed between the commencement of the structure and its completion.

While the general features of Decimus Burton's design have been followed, the construction of the North Wing is much lighter than that of the South. The material used is rolled steel. The house was erected with rapidity and thorough precision in the workmanship by Messrs. Mackenzie and Moncur, of Edinburgh, and glazed under their direction by Messrs. Rendle. The drawings were prepared and the whole work supervised by E. G. Rivers, Esq., the Surveyor of Her Majesty's Office of Works in charge of Kew.

Each wing is 116 feet long by 64 feet wide and (inside) 38 feet high. Four lobbies, each 12 feet long by 7 feet wide, two at either end, connect the octagons to the wings and the central part to the octagons. Beyond the wings are entrance porches, each 12 feet by 8 feet.

The total extreme length of the building is thus 628 feet, and, including the porches at either side, the greatest width is 164 feet.

The cost of each wing has been about £7,000. The total cost of the whole building has been, therefore, £43,000. This includes the provision of spacious under-ground tanks for the collection of rain-water.

In the original scheme of the house, Sir William Hooker had in view the completion of the representation of the woody vegetation of the world. That of the Tropics was provided for in the Palm House, and that of the Cool Temperate Zone in the Arboretum. The object of the Temperate House was to provide accommodation for the plants of intermediate climates which would not tolerate an English winter. Sir William Hooker explains, in his Report for 1859, that "as the contents of this structure will be of the same character as those hardy plants which constitute the 'Arboretum,' it is the intention to erect it within the so-called Arboretum or Pleasure Ground," as that was then termed.

In his *Report* for 1866, Sir Joseph Hooker, in again urging "the completion of this grand structure, by far the finest in Europe," suggested "devoting one of the contemplated wings to the plants of our northern colonies and possessions, and the other to those of the southern."

In the centre block Australian and New Zealand vegetation is predominant. As explained in the *Kew Bulletin* for 1897 (p. 334), the contents of the South Wing have largely a Mexican character. In other words, it is devoted to plants of warm temperate countries, which in cultivation require a "warm greenhouse" treatment.

The North Wing, on the other hand, has been devoted to Himalayan, Chinese, and Japanese plants, which, while for the most part able to resist an English winter, are unable to tolerate the rigour of an English spring.

The plan of laying out the ground in the interior is the same as that of the South Wing. This has been described in the *Kew Bulletin* (l.c., p. 334). The beds contain a complete collection of Himalayan rhododendrons, together with some of their most striking tender hybrids, camellias, etc. The centre walk is lined with clumps of the Japanese *Phyllostachys mitis*, obtained from Algeria. At the north end there is a rock pool on either side.

The North Wing, when given up by the contractors, was furnished with great rapidity, largely due to the generosity of D. H. Shilson, Esq., of Tremough, Cornwall. This county is the natural home of these magnificent plants in England, and now repaid its debt to Kew, from which it originally received them when introduced by Sir Joseph Hooker. The late Mr. Shilson, father of the present owner of Tremough, was one of the first to take up their cultivation. "Several of the plants" transported from Cornwall to Kew are said to have "required a separate railway truck each, and were nearly two tons in weight." A prominent feature is a large camellia 15 feet high, removed from Kensington Palace Gardens, where it had been grown by Mrs. Falk, who presented it with other plants to the Royal Gardens.

The fine and lofty specimen of *Trachycarpus excelsus* (Chamærops excelsa) was the gift of the Right Honourable Joseph Chamberlain, M.P., F.R.S., from whose conservatory at Highbury, Birmingham, it was removed. It is a happy memorial of the exertions of this distinguished statesman in securing the assent of two successive Governments to the completion of this great undertaking.

It only remains to say that the contents of the two octagons have been re-arranged. They are not well suited for the cultivation of a miscellaneous collection. The southern is now devoted to an orangery which has long been a desideratum at Kew; the northern to standard Bays, &c. Space in each is afforded for the display of trained plants of *Clematis*, &c., in the summer, and of chrysanthemums in the autumn.

An excellent detailed account of the completed structure, with illustrations, is contained in the *Gardeners' Magazine* for May 27, 1899, pp. 310–312.

It may be added that the area of the whole structure is $1\frac{2}{3}$ acres, more than three times that of the great conservatory at Chatsworth.

Queen's Cottage Grounds.—In accordance with the announcement made in the *Kew Bulletin* for 1898 (pp. 200, 201), the Queen's Cottage Grounds were thrown open to the public on May 1. The entrance is near the Isleworth Ferry Gate, and a railed path has been carried through terminating near the path through the Pinetum leading to the Lion Gate. This allows the Cottage, the expanse of wild hyacinths, and the sylvan features of the grounds to be fully seen by visitors without unnecessarily disturbing perhaps the only "sanctuary of all bird life" which remains in the immediate proximity of London.

Bulbs from Asia Minor.—Kew owes its unique display of early flowering spring bulbs in great measure to the constant liberality of Mr. Edward Whittall, of Smyrna. A brief note of his contributions appears in the *Kew Bulletin* for 1893 (p. 147). We owe to him the sheets of white *Galanthus Elwesii* and of blue *Chionodoxa* which each year produce more and more striking effects.

The following letter gives some idea of the scale on which Mr. Whittall works as well as of the important industry which he has incidentally created :—

MR. EDWARD WHITTALL TO ROYAL GARDENS, KEW.

Smyrna, April 28, 1899.

DEAR SIR,

OUR winter has been, comparatively speaking, just as mild as yours in England. You would have been surprised to see my garden at Christmas with the rose trees, geraniums, and even cannas in full bloom, the arums in the ponds full of buds and the camellias backed up by the white Roman hyacinths simply covered with flowers. It was a pretty sight, and one I never witnessed before. Now of course it is wearing its spring garb, and you could cut roses by the thousand. The water lilies are showing their first flowers and the beds are gay with bright colours. I will send you later on a few photographs to give you an idea of an Oriental garden with an admixture of English and Italian ideas in the plan.

I note your requirements of small bulbs, and will be only too happy to ship you all I can on the old conditions. I suppose this will mean some 300,000 or 400,000 of all varieties. By the bye, what did you think of the new snowdrop I sent you ? I flowered it in my garden and certainly it appears to carry out my first description.

I am glad to see the bulb trade developing so much with England. When I commenced it, I only hoped to give a few weeks' work to some deserving poor in our village. Now I employ hundreds of families, and the blessings you British flower-lovers receive should lighten your slumbers as the saying goes in this land of beautiful ideas and expressions. I am now opening out a new trade in cultivated bulbous plants, such as hyacinths, &c., and hope shortly to ship not a few. As you well know, most of these plants came originally from this country and do well. I am proud to see around me the increase in the consumption of flowers, and to feel that it is the result of my efforts to develop the love of them. Some few years back you scarcely saw a plant outside a few European gardens ; now even the smallest cottage plot is bright in Spring with flowers. This is the pleasure I get out of my hobby, and, now that my collecting expenses are covered by European shipments, I cannot even complain of the cost being too heavy.

I was not carried off by brigands, but a nephew of mine. Thank God all is well that ends well.

Believe me, &c.,

(Signed) EDWARD WHITTALL.

Sir W. T. Thiselton-Dyer,
Kew, London.

Jyree Tea.—By the kindness of Mr. G. S. Peterson, of Weston-super-Mare, we have received a sample of this so-called tea, and find that it is made of leaflets apparently belonging to some species of *Acacia*. Mixed with the leaflets are petals which may

well be those of a *Cassia*, and a little ordinary tea had been added to one sample, but Mr. Peterson says that such is not always the case. Jyree tea is the name under which this mixture has been offered for sale in Britain. It is of Indian origin, probably from Madras, and cannot as yet be said to have any extensive use. "Jyree," we are informed, is a name derived from that of the native servant of an Anglo-Indian who claims to have discovered its virtues. "Jyree" oil is said to be a cure for aches and sprains: "Jyree" soap is said to soften the skin, and "Jyree" may be used, too, for softening leather.

Moseleya.—In a recent number of *Hooker's Icones Plantarum* a very rare plant, which was originally described as *Hornemannia pinnata*, Benth., and subsequently reduced by the same botanist to the genus *Sibthorpia*, is figured (t. 2,592) under the name of *Moseleya pinnata*, Hemsl. Excellent specimens received from China seemed to warrant restoring this interesting plant to generic rank, and as the name *Hornemannia* was already in use, the genus was dedicated to the memory of the late Professor H. N. Moseley. Shortly after this publication, Mr. N. E. Brown recognised in it the *Ellisiophyllum reptans*, Maxim., founded on Japanese specimens in 1871, and described by the author as "inter Polemoniaceas et Hydrophyllaceas." So few specimens existed in herbaria that nobody appears to have identified Maximowicz's Japanese plant with that described by Bentham from India, though the late Dr. Baillon (*Bull. Soc. Linn. Par.*, 1890, p. 817) referred it to the Scrophulariaceæ, and the vicinity of *Littorella*. As there is no doubt of the identity, *Ellisiophyllum* is the name to retain, and it is to be hoped that the name of Moseley may yet be connected with a plant previously undescribed.

Catalogue of the Kew Library.—This has been printed for the convenience of the staff and of botanists working in the establishment. The preface, by the Director, re-produced below, gives an historical account of the origin, formation, and development of the library. The catalogue is printed on one side of the paper throughout. It will be useful, therefore, as a basis for the library catalogues of similar establishments. A limited number of impressions have been struck off, and these may be obtained, price 7*s.* 6*d.* (exclusive of postage), on application to the Curator, Royal Botanic Gardens, Kew.

"A library of books of reference is a necessary adjunct to a Botanic Garden in order to illustrate its contents and verify their nomenclature. For a large herbarium it must be even more extensive, as constant reference has to be made to the descriptions given by multitudinous writers of the plants of every country of which such a herbarium contains specimens. Still more copious must it be for an establishment like Kew, which is constantly called upon to afford information to the public and the Government on every subject connected with the vegetable kingdom.

"The foundation of Kew as a scientific establishment dates from 1759, in which year the Princess Augusta of Saxe-Gotha, Dowager Princess of Wales (who resided at Kew till her death in 1772), established a Botanic, or, as it was then called, a Physic Garden. In the development of the collections the Dowager Princess of Wales had the assistance of John Stuart, third Earl of Bute, who had been Lord of the Bedchamber to the Prince. He was the possessor of a fine collection of botanical books and used a house adjoining the Royal Gardens, now known as Church House, as a library.

"The Earl of Bute fell out of favour with George III., and retired to his house near Christchurch, in Hampshire, where he died from the effects of a fall while collecting a plant, in 1792.

"His place as scientific adviser at Kew, and, in point of fact, as honorary director, was taken by Sir Joseph Banks, the president of the Royal Society and a personal friend of the King. He was the possessor of one of the finest libraries of botanical books which has ever been formed. The celebrated Robert Brown was his librarian, and part of his duties was to afford scientific assistance to the Superintendent of the Royal Botanic Gardens at Kew. Banks bequeathed his library a few months before his death to the trustees of the British Museum, where it is still preserved. But he left Brown the use of it during his lifetime, and an annuity, on condition that he continued his scientific aid to Kew.

"Besides this, the official residence of the Superintendent, now used as the business offices of the establishment, contained a room which was used as a library. In 1841 the maintenance of Kew was transferred from the Crown to the public charge. The books in his care disappeared, being regarded probably either as the private property of the superintendent, or as that of the Crown.

"During the reign of George IV. Sir Everard Home, who appears to have succeeded to the honorary position occupied by Banks (*Kew Bulletin*, 1891, p. 319), suggested the establishment of a library at Kew. The charge was to be entrusted to the well-known botanical artist, Francis Bauer. According to a statement in Loudon's *Gardener's Magazine* (vol. xvii., 1841, p. 187) 'The house now belonging to the King of Hanover was purchased for this purpose; the shelves were prepared, all the botanical books in the King's library were to be removed there, and some had, in fact, been sent down, when, unfortunately, a dispute arose respecting the land, to which the Woods and Forests laid claim.'

"This statement is not absolutely exact. The house never belonged to the King of Hanover, though it was for a time occupied by him. It was known as Hunter House, having been the property of a successful man of business, Robert Hunter, who had settled at Kew. It was purchased in 1818 by George III. at the instance of Sir Joseph Banks, and for the purpose—to which it has long since been devoted—of a library. Sir Everard Home simply endeavoured, therefore, to carry into effect Banks's scheme. In 1823 George IV. sold the house and grounds to the nation, its use as a library having, apparently, as stated above, been abandoned. In 1830 William IV. granted it to the Duchess of

Cumberland for her life. It was only on the Duke's accession to the throne of Hanover that it became known as the 'King of Hanover's House.' He resided in it occasionally, but after his death it remained unoccupied.

"When, therefore, in 1841, Sir William Hooker was appointed Director of the reorganized Botanic Garden, he found himself destitute of even an official commencement of the two essential requisites of a scientific botanic establishment—a herbarium and library. Fortunately he was personally well provided in both respects, and he generously offered to make available for public use those which he himself possessed. The Government, on its part, agreed to rent a neighbouring house, afterwards known as West Park, for their accommodation, and as a residence for the Director, 'there being no suitable house belonging to the Crown vacant at the time.' In 1852, though still remaining his private property, the Director's herbarium and part of his library were removed to the present building. Its occupation for the purposes of the library and herbarium dates from that year.

"In the same year the commencement of an official library at Kew was made by the gift, by Miss Bromfield, of the botanical books of her deceased brother, Dr. W. A. Bromfield; its especial feature was the number of fine copies, chosen with fastidious taste, of the earlier botanical authors. This was followed in 1854 by the gift by the late George Bentham, Esq., C.M.G., F.R.S., from 1861 to 1874 President of the Linnean Society, of his fine botanical library, which was very complete in what may be called 'working books.'

"In 1867 (after his death) the Treasury sanctioned the purchase of such of Sir W. Hooker's books as were wanting in the library, and which, though the establishment had had the use of them, were not its property. These included many scarce and costly books which rarely come into the market, and had been procured with much trouble and expense on the continent; there was also a valuable collection of travels. At the date of his decease Sir W. Hooker was the possessor of the finest private botanical library in existence, the result of nearly sixty years' assiduous collecting. Through this purchase the Kew library was more than doubled in extent.

"These three important acquisitions formed the backbone of the present library. Gaps have been gradually filled up by subsequent gifts and bequests. A number of volumes mostly relating to Cryptogamic Botany were received in 1887 from the late Rev. M. J. Berkeley, F.R.S. The most important bequest was that in 1889 of the botanical library of the late John Ball, Esq., F.R.S., Parliamentary Under Secretary of State for the Colonies, 1855–7, and first president of the Alpine Club. This was rich in works relating to the European flora, and in fine copies of books mainly collected in Italy.

"In 1892 Thomas Hanbury, Esq., of La Mortola, Ventimiglia, Italy, presented an important selection of books from the library of his late brother, Daniel Hanbury, F.R.S., the well-known pharmacologist.

"In 1877 the interior of Hunter House was remodelled in order to give more convenient accommodation for the library.

"The purchase of new books has been provided for since 1849 by a small annual subsidy from the Government. And this has been further supplemented more recently by the grant of free binding by H.M. Stationery Office. A large number of serials and periodicals in which the library is especially rich are acquired by exchange with the *Kew Bulletin*. The Bentham Trustees from time to time use the funds at their disposal, in accordance with the testamentary dispositions of the late George Bentham in the purchase of books beyond the means of the annual Government grant. The library being also available for the scientific researches of botanists of all nations, is constantly in receipt of valuable contributions from foreign governments, universities, societies, and independent workers. The liberality of the United States and French Governments deserve especial mention.

"On the whole it is probable that no official library of such conspicuous utility has ever been got together at so small a cost to the public. Its primary object is necessarily the routine work of the establishment. Subject to the requirements of this it is freely available for the use of independent scientific workers, a privilege which is largely taken advantage of. But it is not available for merely literary purposes or work.

"The manuscript catalogue having become unmanageable, the Treasury sanctioned in 1896 the employment of B. Daydon Jackson, Esq., Secretary to the Linnean Society, to prepare, with the assistance of the scientific staff, a new one, which should be based on a fresh collation of the books. It was further decided that this should be printed and published. It is hoped that apart from its immediate purpose it will be found of service as a bibliography, and for use in other scientific and technical libraries.

"The present catalogue has been brought down to 1898. Annual lists of future additions will be published in the *Kew Bulletin*.

W. T. Thiselton-Dyer,
Director.

Royal Botanic Gardens, Kew.
March, 1899.

Curaçao Aloes.—This drug was formerly supposed to be derived from the same plant as Barbados aloes (*Flückiger and Hanbury, Pharmacographia*, 2nd ed., p. 679). The latter is yielded by *Aloe vera*, L. (A vulgaris, *Lam.*) Of the plant yielding the former, Mr. E. M. Holmes obtained authentic specimens through Professor Van Eeden, of Haarlem (*Pharm. Journ.*, September 13, 1890, p. 205). They were unhesitatingly referred by Mr. J. G. Baker to *Aloe chinensis*, Baker (*Bot. Mag.*, 6,301), of which the native country is unknown.

Mr. Holmes remarks :—

"It would appear that the Curaçao aloe plant is nearly allied but yet specifically distinct from *A. vera*, L. (A. barbadensis, *Mill.*), so that the specific difference might go far towards explaining the characteristic odour and appearance of Curaçao aloes as compared with the Barbados aloes of commerce."

Mr. Consul Jesurun, in his *Report on the Trade of Curaçao and its Dependencies for* 1898, p. 7, gives the following account of the present state of the industry :—

"A trifling quantity of aloes came from the Island of Aruba, and has been re-shipped to New York, the only market where anything near the cost price of manufacturing could be obtained for the indifferent quality. Aruba, Bonaire, and Curaçao could produce very clean and high grade aloes were the price for such quality any better than that obtainable at present on foreign markets, where buyers give preference to the dirty or low grades on account of cheapness, and because those who handle this article abroad are able to obtain, by means of suitable machinery and processes, the exact grade desired at a far lower cost than is possible in these islands. The low prices for this article have been yielding less, owing to the higher duties levied by this Government, and the producers and exporters have suffered greatly. In the Island of Bonaire, where there are large tracts of land planted only with aloes, the producers are unable to export any quantity for the above reasons, and the same is to be said as to this island."

Assam Rubber in Egypt.—A short note in the *Kew Bulletin*, 1897, p. 429, announced the commencement of an attempt to produce rubber from *Ficus elastica* in Egypt. The following two supplementary letters show the promise that Mr. Floyer has met with in continuing the experiment :—

MR. E. A. FLOYER TO ROYAL GARDENS, KEW.

Cairo, July 17, 1898.

SIR,

THANK you for sending me the *Bulletin* about our india-rubber.

This year we are trying the yield of each tree. Mr. Luiji Heinschneider, of the Gezira Palace, has placed some trees 28–30 years old at our disposal. So far two are tapped. No. 1 gave 2½ lbs.; No. 2, 5½ lbs. The tapping is conducted with a view of getting another yield next year from the same trees.

The year's crop of cuttings will be about 7,000 only. We are still unsuccessful with seed.

Yours truly,
(Signed) ERNEST A. FLOYER.

Cairo, June 12, 1899.

DEAR SIR WILLIAM,

THE three trees, *Ficus elastica*, which I tapped last year, and which yielded 10½ lbs. of rubber, sold at 3*s.* 3*d.* per lb., have been tapped again this spring. They yielded 5¾ lbs. of rubber, the principal falling off being in tree No. 2, which is much overgrown by tree No. 1.

I have put out this spring nearly 3,000 *Ficus*, and hope in due time a rubber industry may be started.

Yours truly,
(Signed) ERNEST A. FLOYER.

Pæony disease.—Pæonies have shared in the revived popularity of herbaceous gardening. Frequent complaints are, however, made of their liability to disease. Characteristic specimens have been received this year from the Royal Botanic Gardens, Glasnevin. The following report was furnished upon them, which is published for general information :—

The Pæonies are suffering from "drooping disease," caused by a minute fungus called *Sclerotinia Pæoniæ*.

Spraying at intervals of four days with a solution of potassium sulphide (1 oz. of potassium sulphide dissolved in 3 gallons of water) will check the spread of the disease.

To prevent a recurrence next season, diseased leaves should be removed promptly, to prevent the formation of sclerotia in the diseased tissue. During autumn, the soil should be removed from the crown and round the root, and replaced by fresh soil mixed with quicklime.

Spray next season, at intervals of a week, with potassium sulphide solution, commencing first when the leaves appear above ground.

G. M.

May 5th, 1899.

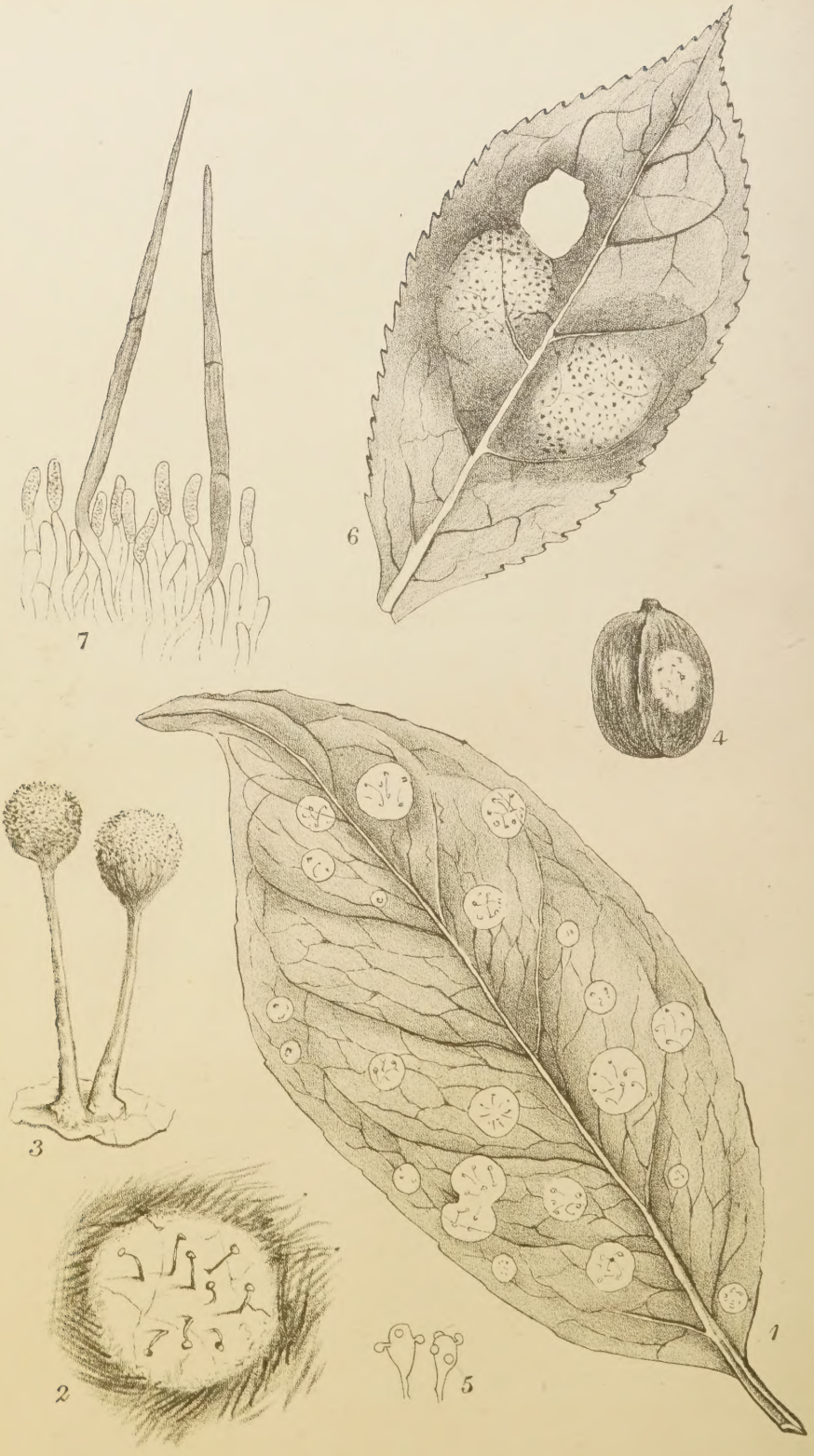
Cultivation of Turnsole.—The Parisian daily paper *Le petit Journal* of December 11, 1898, contained the following account of the cultivation of *Chrozophora tinctoria* at Grand Gallargues in the department of Gard, South France :—

"This year's harvest, which has been a fairly good one, is for the most part as usual absorbed by the Dutch cheese industry. Our soil is peculiarly suited to the cultivation of *Chrozophora tinctoria* (Croton tinctorius ; *Croton des teinturiers* or Turnsole), and it grows with us even in a wild state.

"When the reaping is done, our farmers gather the stems and leaves together and place them in small heaps on the outskirts of the village to ferment. Fermentation brings about the changes necessary for the development of the fine red dye, which for centuries has been employed by the Dutch cheese-makers. Year by year for several centuries has a Dutch ship put into Cette and taken off a cargo of Croton stems and leaves prepared as just described.

"To give them their red colour, the cheese manufacturers of Holland wrap their cheeses in the Croton leaves and take them out the red balls, which are exported the whole world over. Grand Gallargues is thus the source of the red of the Dutch cheese."

A little of interest may be added to the above. Not until 1808, was it shown clearly that turnsole could be cultivated from seed. Before this date, the people of Grand Gallargues, which, then, as now, was the centre of the industry, harvested their entire crop from wild plants. Year by year in the months of July, August, and September, they scattered through the departments of the South of France—Bouches du Rhône, Var, Gard, Hérault, Pyrénées orientales and Vaucluse—gathering the plants where abundant, and fermenting them on the spot.



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